UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

Docket No. 40-8752

Mr. Thomas A. Clary
Pinal Mining and Minerals, Ltd.
P. O. Box 1010
Miami, Arizona 85539

Dear Mr. Clary:

This letter acknowledges your request of September 6, 1979, for a byproduct material license application form. The NRC currently does not have an application form specifically for mill tailings as a byproduct material, although a form for this purpose is in preparation.

Therefore, we are enclosing the following materials to aid you in preparing an application for a mill tailings byproduct material license in lieu of such a form:

1. NRC Regulatory Guides 3.5 and 3.8

2. NRC Branch Technical Position--Uranium Mill Tailings Management

3. Proposed NRC Regulations 10 CFR Parts 40 and 150: Uranium Mill Tailings Licensing

4. Form NRC-2, Application for Source Material License

The NRC Guides 3.5 and 3.8 are mainly concerned with mill operations, but include certain items relevant to mill tailings. If you wish to apply for a mill tailings byproduct material license, information called for in these guides which is applicable to tailings management and disposal, and other information which you believe is important in such considerations, should be provided. The points which are covered in the enclosed branch technical position paper and recently proposed regulations of the NRC should be used as guidance in preparing your application. It is particularly important to include the following information:

1. Characterize the radiological and nonradiological contaminants in the tailings, their physical properties (e.g., average rock or particle size, density, moisture content), chemical compositions, etc. needed to define the potential environmental impacts.

2. The proposed methods of tailings management and disposal, including specific steps to be taken to address the following concerns:

   -- Long-term stability of tailings isolation.

   -- Groundwater impacts from tailings.

   -- Airborne emissions during operational and postoperational periods, both particulates and radon emissions.

   Alternative management and disposal schemes considered should also be described.

3. For completeness, the information supplied should include a brief description of the uranium extraction processes which produce the tailings.

The form NRC-2 is enclosed for convenience. The general information on this form (items 1 through 6, 10, and 15) should be provided. In addition, please delete "Source Material License" in the title and write in "Byproduct Material License for Uranium Mill Tailings." The application and relevant information should be returned to the Director of the Division of Waste Management, Office of Nuclear Material Safety and Safeguards, Nuclear Regulatory Commission, Washington, D.C. 20555.

In response to a State request for technical assistance, we have already been reviewing your application for renewal of the source material license for the Lucky Boy operations. Attached also are lists of specific information relating primarily to radiological and tailings management aspects of your operations, requested through the State, to complete that review. We expect that providing the specific information requested of the State should largely supply the general information needs identified above.

If you have any questions, please contact George Wu (301) 427-4103 of our staff.

Sincerely,

Hubert J. Miller
Uranium Recovery Licensing Branch
Division of Waste Management

Enclosures: As stated

cc: w/o enclosures
Lynn FitzRandolph, AAEC

PRINCIPLE PARAMETERS FOR RADIOLOGICAL ASSESSMENT

Parameter	Value
Ore quality, U_3O_8	_____ %
Ore activity, U-238, U-234, Th-230, Ra-226 and Pb-210	_____ pCi/g
Operating days per year (plant factor)	_____ days
Ore process rate	_____ tonnes/yr
Mill water throughput	_____ m^3/yr
Total mine area	_____ m^2
Active mine area	_____ m^2
Average mine depth	_____ m
Annual average morning mixing height	_____ m
Annual average afternoon mixing height	_____ m

Ore Handling & Storage

Estimated capacity of ore per delivery	_____ MT
Number of deliveries	_____ per day/per week
Estimated ore dust released in delivery	_____ kg/hr or MT/yr
Average grade of ore and ranges	_____ %
Capacity of ore pad: present and final year of operation	_____ MT
Maximum area of ore pad and height in terms of final year of operation	_____ m^2, m
Approximate amount of ore handled per day i.e., unloaded, loaded, bulldozed, etc. ...	_____ MT/day

Operation time of front end loaders, hoppers, feeders and other ore pad equipment _____ hrs/day

Estimated amount of fugitive ore dust emission due to handling of ore on ore pad _____ kg/hr

Dust emission control reduction factor by wetting, chemical or other controls _____ %

Ore pad area and height _____ m^2, m

Ore storage time _____ days

Crushers, Grinders, Rod Mills, Fine Ore Blending.

For each piece of potential radioactive emission source equipment please report the following (in terms of final year of operation)

Operation time (hrs/day & days/year) _____

Ore process rate _____ MT/yr

Total ore quantity handled _____ MT/yr

Estimated dust lost to atmosphere _____ kg/hr or MT/yr

Efficiency of emission control devices (effective as well as design) _____ %

Estimated dust lost to atmosphere through internal ore transportation (e.g., conveyor belts) devices _____ kg/hr, MT/yr

Efficiency of emission controls of internal ore transportation devices (effective & design) _____ %

Average daily capacity of temporary bin storage (fine ore bins) _____ MT/d

Efficiency of controls for temporary bin storage _____ %

Yellowcake drying & packaging (based on last year of operation)

(Please give parameter values for dryer & packaging)

Processing rates _____ MT/hr

Operation time (days/yr & hrs/day) _____

Efficiency of control of U_3O_8 dust released to atmosphere (design and effective) _____ %

Estimated U_3O_8 dust released to atmosphere _____ kg/hr

Stack height(s) _____ m

Recovery rate of U_3O_8 _____ %

Extraction efficiency _____ %

Yellowcake yield _____ tonnes/yr

Yellowcake quality, U_3O_8 _____ %

Yellowcake drying stack effluent, U_3O_8 _____ kg/yr

Yellowcake drying stack filter efficiency _____ %

Heap Leach Piles

Dimensions (height width, length) _____ m, m, m

Volume _____ m^3

Capacity _____ MT

Pile activity for U-238, Th-230, Ra-226, and Pb-210 _____ pCi/g

Fugitive dust emissions _____ kg/hr or MT/yr

Control efficiencies for dusting _____ %

Tailings (Please base values on final year of operation)

Area, volume, capacity of sand tailings _____ km^2, m^3, MT

Area, volume, capacity of slime tailings _____ km^2, m^3, MT

Area, volume, capacity of submerged tailings _____ km^2, m^3, MT

If different grades of ore have been used or are going to be used, please indicate for each grade choice

Area, volume, capacity of sand tailings _____ km^2, m^3, MT

Area, volume, capacity of slime tailings _____ km^2, m^3, MT

Area, volume, capacity of submerged tailings _____ km^2, m^3, MT

Operating time for each grade _____ yrs

Fraction of U-238, Th-230, Ra-226, Pb-210 to tailings for each particular grade _____ _____ pCi/g

Tailings density _____ g/cm^3

Drying time prior to reclamation _____ yrs

Efficiency of controls for fugitive dusting (wetting, chemical, etc.) _____ %

Tailings activity, U, Ra-226, Th-230, and Pb-210 in slimes _____ pCi/g

Tailings activity, U, Ra-226, Th-230, and Pb-210 in sand _____ pCi/g

Tailings activity, U, Ra-226, Th-230, and Pb-210 in solution _____ pCi/l

Total tailings area _____ m^2

Tailings pond (solution) area _____ m^2

Tailings impoundment depth (final year) _____ m

Tailings density _____ g/cm^3

Seepage rate from tailings impoundment _____ gpm

Fraction U, Th-230, Ra-226, and Pb-210 to tailings _____ %

Land Use & Grazing of Cattle

Fraction of year spent grazing locally _____ %

Fraction of feed which is pasture graze while grazing _____ %

Fraction of stored feed which is grown locally _____ %

Acreage required to graze one animal unit (450 kg) for one month (AUM) _____ ha

Locations of sources & receptors

All locations should be given in terms of
x kilometers east of the yellowcake dryer stack
y kilometers north of the yellowcake dryer stack
z meters elevation from the base of the yellowcake dryer stack
(NOTE: Locations to the south and/or west shall be denoted by a negative value.)

Sources	(km) east	(km) north	(m) elevation
1. Yellowcake dryer	0	0	--
2. Grinder(s)	--	--	--
3. Crushers	--	--	--
4. Rod Mill	--	--	--
5. Ore Pad	--	--	--
6. Fine Ore Blending	--	--	--
7. Tailings pond no. 1 (mid point)	--	--	--
8. Tailings pond no. 2 (mid point)	--	--	--
9. Heap Leach Pile	--	--	--
10. Other sources	--	--	--
Extra Receptors			
1. Nearest Resident	--	--	--
2. Nearest Resident in Prevailing wind direction	--	--	--
3. Ranch	--	--	--
4. Farm	--	--	--
5. Orchard	--	--	--
6. Grazing Location 1	--	--	--
7. Grazing Location 2	--	--	--
4. Garden	--	--	--
5. Ranger Bunk House	--	--	--
6. Mine Camp	--	--	--
7. Town 1			
8. Town 2			
9. City 1			
10. Other nearby residents industrial (or recreational facilities)	--	--	--
11. Site Boundaries (N, S, E, W, NE, SW, SE, NW)	--	--	--

Demography - Population Distribution

The population distribution should be given in the following manner:

Sectors are marked off by the sixteen compass directions and radial distances along the compass directions up to 80 km (50 miles).

The distances (km) should be broken up in fashion indicated on the following page.

POPULATION DISTRIBUTION

KILOMETERS	N 0.0	NNE 22.5	NE 45.0	ENE 67.5	E 90.0	ESE 112.5	SE 135.0	SSE 157.5	S 180.0	SSW 202.5	SW 225.0	WSW 247.5	W 270.0	WNW 292.5	NW 315.0	NNW 337.5
0.0- .1																
.1- .5																
.5- 1.0																
1.0- 2.0																
2.0- 3.0																
3.0- 4.0																
4.0- 5.0																
5.0-10.0																
10.0-20.0																
20.0-30.0																
30.0-40.0																
40.0-50.0																
50.0-60.0																
60.0-70.0																
70.0-80.0																

Annual Joint Relative Frequency Distributions of Wind Direction, and Wind Speed by Atmospheric Stability Class

Wind Direction - is given in the 16 compass directions.

Wind Speed - is given in knots in the indicated classes:

0-3, 4-6, 7-10, 11-16, 17-21, >21

Atmospheric Stability - is given in the following manner:

A - Extremely unstable
B - Moderately unstable
C - Slightly unstable
D - Neutral
E - Moderately stable
F - Very stable

The following sheet should be prepared for each of these stability classes.

STABILITY CLASS

WINDSPEED CLASS

WIND DIRECTION	0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	OVER 21
N						
NNE						
NE				1		
ENE						
E						
ESE						
SE						
SSE						
S						
SSW						
SW						
WSW						
W						
WNW						
NW						
NNW						

APPENDIX A

SITE-SPECIFIC INFORMATION AND DATA USED BY THE NRC STAFF IN PERFORMING RADIOLOGICAL IMPACT EVALUATIONS FOR URANIUM MILLING OPERATIONS

Table A-1 lists and partially describes most of the information and data commonly used by the NRC staff in performing its uranium mill radiological impact evaluations. All the data detailed in Table A-1 are not always available on a site-specific basis, in which case the staff will employ conservative estimates or assumptions. In some situations, the data identified in Table A-1 may not be adequate, so the staff will attempt to secure additional information. This situation may arise, for instance, when operations at more than one site are involved and the staff is required to evaluate combined impacts. In most cases, however, provision of the data identified in Table A-1 allows the staff to completely fulfill its responsibilities with regard to the preparation of a thorough, knowledgeable, and technically sound radiological impact evaluation.

TABLE A-1

PLANT, PLANT OPERATIONS, METEOROLOGICAL, AND ENVIRONMENTAL DATA ROUTINELY USED BY THE NRC STAFF IN PERFORMING RADIOLOGICAL IMPACT EVALUATIONS

I. PHYSICAL PLANT DATA

A. Detailed site plot plan (overlaid on topographic map, with scale and true north arrow) clearly identifying all locations of

1. Site property boundaries
2. Raw ore storage pads
3. Primary crushers
4. Secondary crushers
5. Crushed ore storage areas
6. Ore grinders
7. Yellowcake dryer and yellowcake dryer stack*
8. Yellowcake packaging area and exhaust stack
9. Tailings impoundments and their boundaries
10. Any heap leach piles and their boundaries
11. Restricted area boundaries if different from site property boundaries
12. Fences

B. Plant operations data

1. General data

a. Ore processing rates for all crushers and grinders, MT/d; hr/d and d/yr operational

b. Raw ore grade, % U_3O_8 by weight, average, and range

c. Fractions of uranium, thorium, radium, and lead in raw ore expected to flow through to tailings

d. Expected yellowcake purity, % U_3O_8 by weight, average, and range, MT/yr produced

e. Expected calendar years of initial ore milling, final ore milling, and completion of tailings area reclamation

*Part of the input to the NRC staff's impact assessment computer code consists of X, Y, and Z coordinates for various release and receptor locations. The staff routinely determines these coordinates with respect to the topographic elevation at the location of the yellowcake dryer stack.

Table A-1 (Continued)

2. Ore storage data

   a. Areas of each pile or bin complex, in m^2
   b. Ore storage masses
   c. Ore grades, % U_3O_8 by weight
   d. Antidusting measures routinely implemented
   e. Anticipated dusting rates, in MT/yr
   f. Anticipated ^{222}Rn releases, in Ci/yr
   g. Fractions of input ore sent to storage

3. Crushing, grinding data

   a. Description of ventilation air filtration equipment
   b. Design efficiency of exhaust filters
   c. Minimum efficiencies of exhaust filters
   d. Filter testing procedure and schedule if applicable
   e. Fraction of time filters not operational or used
   f. Any measured effluent concentrations
   g. Stack heights and airflows
   h. Anticipated release rates, in kg/hr
   i. Anticipated ^{222}Rn release rate, in Ci/yr
   j. Fractions of ore throughput reaching filters as dust

4. Yellowcake drying and packaging data

   a. Processing rates, MT/hr, for drying and packaging if different

   b. Hr/d and d/yr drying and packaging operations are carried out

   c. Description of all ventilation air filtration equipment with design, expected, and minimum efficiencies

   d. Filtration equipment testing procedures and frequencies

   e. Any measured effluent concentrations

   f. Stack heights and airflows

   g. Anticipated release rates, in kg/hr. for the dryer stack, the packaging area ventilation exhaust, and any yellowcake storage area ventilation exhausts

5. Tailings impoundment system data

   a. Complete physical, chemical, hydrological, and radiological description

Table A-1 (Continued)

b. Total area, surface areas expected to be under water, saturated, moist, and dry (indicate surface moisture contents used as basis of estimates)

c. Description of antidusting measures routinely implemented and their expected effectiveness

d. Anticipated dusting rates for saturated, moist, and dry surface areas, in g/m^2 per sec

e. Anticipated ^{222}Rn release rates for underwater, saturated, moist, and dry surface areas, Ci/yr per m^2

f. Estimated drying time required prior to initiation of reclamation procedures and basis

g. Estimated time required to stabilize and reclaim after drying and basis

h. Postreclamation estimated ^{222}Rn release rate, Ci/yr per m^2, and basis

II. METEOROLOGICAL DATA

A. Joint frequency data

1. National Weather Service (NWS) station data

a. Locations of all NWS stations within 80 km (50 mi)
b. Available joint frequency distribution data by wind direction, wind speed, and stability class (3-dimensional numerical array)
c. Period of record by month and year
d. Height of data measurement

2. Onsite meteorological data

a. Location and heights of instrumentation
b. Description of instrumentation
c. Minimum of 1 full year of onsite joint frequency distribution data broken down by wind direction, wind speed, and stability class (3-dimensional array) with a joint data recovery of 90 percent or more

B. Miscellaneous data

1. Annual average mixing depth heights
2. Description (general) of regional climatology, particularly including frequencies and durations of extreme wind speeds

Table A-1 (Continued)

III. ENVIRONMENTAL DATA

A. A detailed topographic map of the area within 8 km (5 mi) of the site showing the locations of all

1. Site boundaries
2. Lands owned, leased, or otherwise controlled (including mill site claims) by the applicant
3. Lands privately owned
4. Lands under the jurisdiction of the U.S. Bureau of Land Management
5. Lands otherwise publicly held
6. Lands useable and available for grazing
7. Private residences or other structures used by the general public
8. Vegetable or other crops, identified by type
9. Private, public, and industrial water wells and natural springs
10. Milk animals (cows or goats)

B. Regional data (within 80 km)

1. Population distributions by direction (16) and radius (0.5, 1, 2, 3, 4, 5, 10, 20, 30, 40, 50, 60, 70, and 80 km) for a recent year (no earlier than 1970), for the last year of expected milling (approximate), and for the last year prior to completion of tailings area reclamation (approximate), with expected age group fractions (if available)

2. Available county food production data, in kg/yr, for vegetables (by type and totals), meat (all types), and milk; and any available future predictions by local governmental, industrial, or institutional organizations

SPECIFIC INFORMATION ON THE
PINAL HEAP LEACH OPERATION AND TAILINGS

1. Please supply the following:

   a) A detailed site map, showing restricted area boundaries, fences, current and planned heap leach pads, tailings storage piles, mined ore storage piles, surface mining areas, evaporation pond, ore and tailings transportation routes, etc.

   b) A local topographic map overlaid on the site map.

   c) A local geologic map overlaid on the site map.

2. Explain the heap leach operations.

   - Describe where and for how long blasted ore will be stored before being transported to leach pad?

   - Describe how ore will be transported.

   - Describe the leach process (e.g., continuous or batch). Describe the procedures for the exchange of fresh ore for tailings at the pad.

   - Estimate the amount of time expected for leaching an average heap (or maximum capacity of heap).

   - Describe the locations of leach pads and give the total number of pads, current or planned.

   - Describe the procedures for minimizing airborne particulates during operation.

   - Describe the procedures to prevent flooding or drainage through the area during operations.

3. Explain the tailings management program.

   - Describe the characteristics and compositions of tailings (e.g., average particle size, weight, volume of blasted rock; tailings acidity, moisture content; chemical and physical compositions of uranium; etc.).

   - Describe the procedures for removal and transportation of tailings from the pad, and the length of time leached rock will remain on the pad before removal.

   - Describe where, how, in what quantities, and for how long tailings will be placed in interim storage, if such storage occurs.

- If any tailings will be permanently disposed of on the surface, describe where, how, in what amount and fraction of total tailings will surface disposal occur. Describe also the disposal scheme, measures that will be taken to minimize seepage, the type and amount of cover materials, and the configurations and dimensions of such disposal piles.

- Describe the procedures for disposing of tailings underground. Give the approximate amounts and fractions of total tailings that will be returned to the underground mine for disposal. Describe also the materials to be used for backfill (if any will be used beyond limestone) and the configurations.

- Describe the procedures to control erosion of permanent tailings disposal areas.

- Give the anticipated plant operation life. Provide the following information about termination of operations:

  . Approximate maximum amount of tailings anticipated.

  . Approximate total area of disturbed land.

  . Plans to dispose of the final leach liquor wastes, and the expected amount of such wastes.

  . The expected amount of evaporite wastes, procedures to dispose of such wastes, and plans for reclamation of the evaporation pond.

  . Financial plans to assure that reclamation of the site will be carried out.